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ABSTRACT

Development is characterized by urbanization. New settlements grow either as enlargements of existing ones or as new population concentrations. Three periods may be distinguished in the growth of a settlement: (1) the wild period of first settling, (2) the consolidation period, and (3) the stabilized society. The number of school-aged children per population is greater in the wild and the consolidation periods than in the stabilized society. Therefore, the basic need for schools in the future fully developed society must be discussed while the school building program is still on paper. School planning authorities should base their decisions on (1) integrated statistics and forecasts, (2) educational output requirements, and (3) long-term economic feasibility assessments. In connection with the programming of actual schools to be built, planners must know: (1) program of requirements, (2) economic plan, and (3) plan of action. School building depends on the supply possibilities of building materials and the manufacturing of suitable components from indigenous raw materials. (Author/MLF)

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part 2

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by
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school building in early development

part 2

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4. School planning in the modern sector

Development In a developing country modern education may increase with the increase of the active population. It is assumed here (compare Part 1) that the modern school system of the country will be dimensioned for an annual intake of 220 children per ten thousand active population (age 15-64). Ultimately this number (220 per year) will comprise all the children and the society will be fully developed.

Modern education asks for a development producing sufficient teachers, equipment and school buildings. With the target of development defined in the modern educational system as above, such development may be feasible, including teachers' training, equipment supply and school building. It will, of course, require integrated planning, based on national research efforts; much of what the OECD advises its Member-states to observe concerning these requirements[1] is applicable also to the early stages of development. These, however, are partly different from later stages. Even in the *modern sector* not only do national peculiarities have to be carefully taken into account, but also the general obstacles to be surmounted in the beginning of *modernization*. Some of these are pointed out in the following sections, but no country can base its development programme only on advise. Development must grow out of the nation's own prevailing conditions; the ICS is prepared to assist Governments in their efforts to achieve the integrated planning which can make their education programme a success.

The school and the Urban Development There is a feature of development which warrants specific attention.

Development, as known today, is characterized by urbanization. New settlements grow either as enlargements of existing ones or as new population concentrations. Modern educational problems are in the early development stages most critical in the rapidly-growing settlements.

Schools may be constructed as settlements grow. Rapidly-growing settlements, however, have a tendency to attract men and women in their settling ages. Consequently many children are born when the settlement is taking shape and the population of the settlement may develop as illustrated in Figure 5.

Each settlement has its own special and internal structure and school planning will have to be adapted to that structure. This fact may be a reminder of planning interdependence.

Authorities guiding the settlement development in rapidly-developing nations should be aware of the practically insurmountable difficulties which school planning authorities may have to face if there was no integrated, cohesive planning when the settlements grew up. The number of children asking for school-enrolment in a new settlement as illustrated in Figure 5 may vary from year to year as shown in Figure 6.

1 Noel Lindsay: *Institutional Arrangements for School building* P.E.B. 6, published July 1975. Available from the Directors of Information. O.E.C.D., rue André-Pascal, 75775 PARIS CEDEX 16, France.

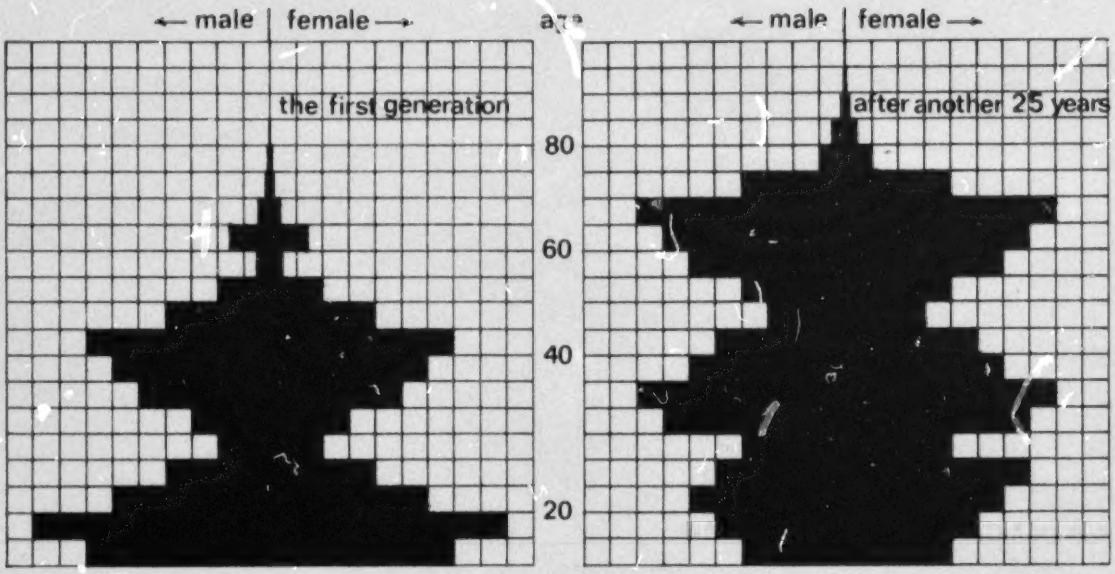


Figure 5. The risk of a New Settlement: Population pyramid development.

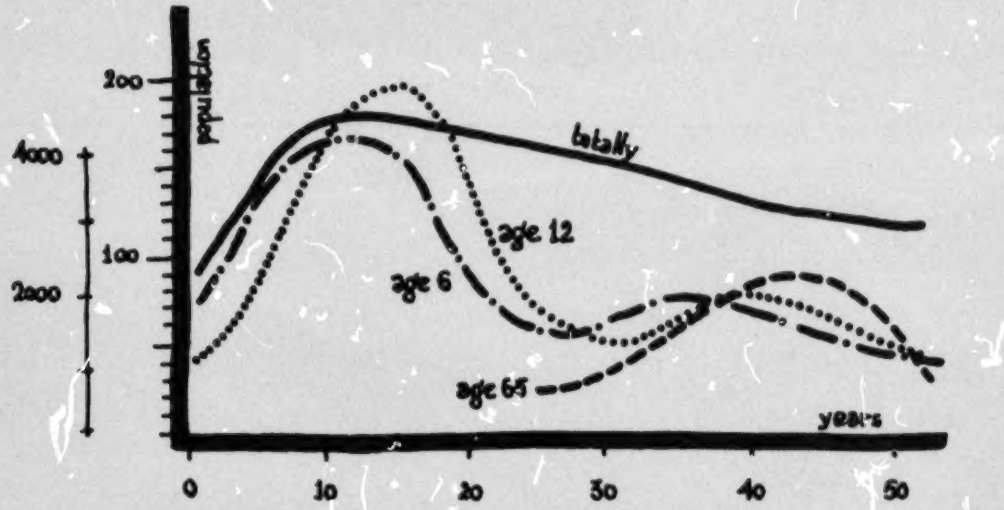


Figure 6. The Risk of a New Settlement: School-planning Difficulties.

Aspects of Macro-planning

1. Planning for education In the growth of a settlement, three periods may be distinguished:
– The *wild* period of first settling,
– the consolidation period, and
– the stabilized society.

It will be advantageous to envisage the *fully-developed* (stabilized) society as early as possible in its development process. This is true both for the nations (the populations of the countries with limited resources) and for the specific parts of the nations (the regions and the local settlements). It is also true for the schools of the settlements. The risk of the *wild* settlement development as regards education planning and school building was shown on Pages 20 and 21.

Most settlements tend to remain for a long time when they have once been built[2]. Modern planning and construction philosophy[3] accept this for the macro-structural elements of a new settlement, but not for the micro-structural units, which should be flexible within the rigid macro-structural framework. This philosophy is valid for schools too.

Schools may be built during the turmoil of the *wild* period of first settling, and a school site may remain a school site as long as the settlement remains a settlement. The main structure (the macro-structural elements) of the school building may be too expensive to reconstruct, so it may have to remain unchanged in the long-term development process. But the functioning of the school building – the educational activities and perhaps other activities too – may change radically and frequently. So the micro-structural elements, such as partition walls and fixed furniture, should be planned and produced for easy removal and reassembly, and the totality of the macro-structure should be designed and constructed with this kind of flexibility in mind.

However, because the siting of schools may not be easily changed when once established, it is essential that the basic need for schools in the future *fully-developed* society be discussed while the school building programme is still on paper.

Even if the *fully-developed* society may be seemingly far off in time, some of the long-term consequences of todays happenings are evident. Such consequences are, for instance, the future main characteristics of the integrated structure of the population as described in chapter 4 *The school and the Urban Development*. By adding to that knowledge an assessment of educational needs and demands (output requirements), it is at least possible to try to fix a pattern of sites for primary and secondary education as anticipated when the society has stabilized and the number of children born annually tends to approach a constant level. This pattern may include some basic assumptions concerning the relationship between *academic* and *vocational* output requirements on different levels. The character of the settlement in view may even warrant at different times a guess on the vocations asked for.

In fact, the broad-line school planning for the *fully-developed* society may be less difficult than the planning of schools for the consolidation period. During that period it may well happen that the number of children of the same age grows to several times the number to be planned for in *the fully-developed* society (figure 5).

It will not be possible to establish any definite rule for the planning and building of schools to meet, during the consolidation period, the consequences of the *wild* period of the first settlement.

Two points, however, may be worth noting:

1. Settlement planning in an early stage must try to counteract the disbalancing of the age-group structure of the population in the new settlement; and
2. People who settle must understand that the number of children during the consolidation period cannot rule the long-term education planning[4].

If the economy permits a school building programme fully meeting the requirements for education also during the consolidation period, then of course the schools built for many children may be only partly needed for education when the society has stabilized. In such a case, the flexibility of the school building is still more urgently required. The flexibility, then, will imply the change-over from school activities to other activities in the same building.

There is another possibility too: Permanent school buildings may be built

2 Full replanning can only be thought of if the settlement happens to be totally destroyed.
3 The International Union of Architects; Seminar on *Human Habitat*, Bucharest, September-October 1971.
4 This, again, is a strong point for family planning: to achieve better educational possibilities for everyone. Education, after all, is a key to development.

according to a programme based on future stabilized population, and the *excess children* during the consolidation period may be educated in provisional schools, either in buildings to be used for a different purpose in the future or in temporary buildings to be taken down when the population stabilizes. In extreme cases, intermediary education philosophy may have to be accepted also in urban school planning.

But whatever method the school planning authorities prefer to use, they should base their decisions on the threepronged calculation input:
– Integrated statistics and forecasts,
– educational output requirements, and
– long-term economic feasibility assessments.

The final aim must be an ideal distribution of optimal educational facilities in the *fully-developed* society.

2. Planning for building Most of what has to be thought of when planning for the individual buildings in rapidly-growing towns – all towns start from villages! – falls under the heading of micro-planning. The consequences of the macro-planning for micro-planners, however, should not be forgotten.
The following chapter will show that the lack of locally-produced suitable building materials presents a major obstacle to urban development. This should remind planners that their macro-planning must include the planning not only of what should be built where, but also how it should be built. This macro-planning problem will be dealt with in more detail later within the context of its relationship of micro-planning (Chapter 5 *The Supply problems*).

Aspects of Micro-planning Farsighted broad-line macro-planning as described in the preceding Section is a good thing, but in connection with the programming of actual schools to be built as soon as possible it is necessary to know more exactly what the requirements are. Planners may guess and assess what may happen in the future, but in practice they must know precisely what to do when it has to be done.

Every client will have to consider his building project from three aspects: End result, Budgeting and Procedures decision-sequence and timing.

These three aspects are interrelated, of course, but they may be presented in three different documents:
– Programme of requirements.
– Economic plan.
– Plan of action.

1. Programme of Requirements It is a well-known fact that the risk of making fatal mistakes – functionally and economically – is much bigger in design than in construction. Wrong situation, wrong dimensioning, wrong communications, wrong emphasis of the education, wrong estimation of future needs, bad planning of space utilization or wrongly applied flexibility requirements are all mistakes to be avoided in a well-prepared programme or requirements.

It is not possible to go into all the aspects of the working out of a programme of requirements for a school without knowing more about the specific purpose of the school and the actual conditions under which it is being built.

Too many mistakes have been made, and are still being made, by assuming that there is a standard solution to school building which can be applied in principle anywhere. There is no such universal standard solution, but methods of making programmes of requirements may be standardized on the basis of local (or national) socio-economic development conditions, while building methods may be standardized on the basis of local (or national) supply possibilities.

Some of the factors to be observed in the socio-economic development for which the school is built have been discussed in previous Sections, and so will not be repeated here.

The supply possibilities which are fundamental for a cost-reducing standardization of production methods have to be studied locally. The programme of requirements must take these supply possibilities into account, thereby promoting the development of a domestic building materials industry (see further under *3. Plan of Action*, Chapter 4).

The programme of requirements, then, must formulate the requirements based on careful studies of the maximum usefulnes of the end result – not only now, but twenty, thirty, perhaps forty years ahead – to be produced within a framework of possibilities. These, of course are the immediate economic possibilities, but they must also focus in the future development, not only the development of the educational system which the school is serving, but also of the building materials industry and the construction industry in which this specific project constitutes a link in the chain of new creations. The ICS has specialized in the development of programmes of requirements for schools with these aspects in mind.

2. Economic Plan In most developing countries five-year plans are stating in money terms what may be spent on buildings in different sectors during the years ahead. This may not be the best way of economic planning, because teachers, teaching aids and school buildings all belong to the same category of expenditures which together may be considered as capital investment for the future (the development).

Obviously the balance between investment and running costs in early development cannot be the same as in the later stages of development. Teachers' training, teaching aids development, and school building should be given highest priority.

It may, indeed, be a mistake to express school buildings only in money-terms. Especially rural primary schools may well be built by the rural population using traditional methods which may not involve any (or very small) expenditures in cash. The methods of school planning for intermediary education were discussed earlier in Part 1.

The more complicated production procedure of modern buildings refers to the production of schools – especially secondary – in developing urban settlements, where buildings have to be paid for in money and where consequently the school building authority has to fix a budget for each school. In such a budgeting process, however, two points must be observed:

– *First* The secondary school may not be a unit by itself. Modern social philosophy tends to recommend the integration of schools with other activities involving young people as well as adults, not only for further education (e.g., library, reading), but also for physical training and games, improvement of skills, etc.

This means that programming and economic planning should be discussed and eventually shared between different authorities, aiming not only at a better use of the built-up environment, but also at savings in the respective budgets.

– *Second* It is bad economy to use all the money available for a school building to cover direct expenditures for this school only. Authorities acting as clients for buildings seem to have a tendency to overspend on individual projects to make them as perfect as possible.

This is a shortsighted policy. Even if present school buildings suffer from budget reduction, development requires that long-term investment, for instance in the manufacturing of suitable standard components including related research and industrial design, are paid from actual building budgets. Some countries, therefore, base their long-term building development (especially *research*) on compulsory deductions from all actual building budgets. School building authorities may solve this budgetary problem either for themselves or in co-operation with other building clients.

Once the limit of the budget for the individual school has been decided upon, the economic plan for the building should be established. This plan includes not

	(1)	(2)	(3)	(4)
(0)	SITE (10) prepared site	SITE (20) structures	SITE (30) enclosures	SITE (40) roads, paths pavings
(1)	ground (11)	wall structures external (21)	wall completions external (31)	wall finishes externally (41)
(2)		wall structures internal (22)	wall completions internal (32)	wall finishes internally (42)
(3)	floor beds (13)	floor structures (incl. gallasics) (23)	floor completions (33)	floor finishes (43)
(4)		stair structures (incl. ramps) (24)	stair completions (balustrades) (34)	stair finishes (44)
(5)			ceilings, suspended (35)	ceiling finishes (45)
(6)	foundations generally (16)			
(7)	pile foundations (17)	roof structures (27)	roof completions (37)	roof finishes (47)
(8)	other building foundations (18)	other building structures (28)	other building completions (38)	other building finishes (48)
(9)	BUILDING ground foundation (19)	BUILDING structure (29)	BUILDING completions (39)	BUILDING finishes (49)
(–)	ALL OTHER COST (NOT ELEMENTS) (0-)			

only the final cost to be allowed, but is divided into two separate documents:
– Cost break-down and
– cash flow chart.

The cost break-down should be made according to a standard method applicable to all school buildings for easy reference, easy comparison between different schools, and easy cost control.

The standard method helps the planner not to forget anything while statistical data will be available after a few years, what will help the planner not to make wrong assumptions. The ICS has specialized in standard cost break-down on the SfB-system (authorized for international use by the CIB[5] and recommended for schools by the OECD[6] and by the ECA[7] expert meetings[8]).

5 CIB report No. 22, published by the International Council for Building Research, Studies and Documentation, Weena 700, Postbox 20704, Rotterdam, The Netherlands. Consultants to the the United Nations.
6 See foot-note No. 1.
7 United Nations Economic Commission for Africa, Box 3001, Addis Ababa, Ethiopia.
8 Reports E/CN. 14/416, E/CN.14/460 and E/CN.14/496.

(5)	(6)	(7)	(8)	(9)	(–)
SITE (50) services (piped, ducted)	SITE (60) services (electrical)	SITE (70) fittings	SITE (80) landscape play areas	SITE (90) ELEMENTS	
services centre (piped, ducted) (51)	services centre (electrical) (61)	fittings: – display – circulation (71)			
services drainage refuse disp. (52)	services power distribution (62)	fittings: – rest, work – play (72)			
services water supply other liquids (53)	services lighting (63)	fittings: – culinary – eating, etc. (73)			
services gas supply compr. air (54)	services communication (64)	fittings: – sanitary – hygiene (74)			
services space cooling (55)		fittings: – cleaning – maintenance (75)			
services space heating (56)	services transport (66)	fittings: – storage – screening (76)			
services ventilation air conditioning (57)					
other services (piped, ducted) (58)	other services (electrical) (68)	other fittings (78)			
BUILDING (59) services (piped, ducted)	BUILDING (69) services (electrical)	BUILDING (79) fittings		BUILDING (99) ELEMENTS	
				ALL (9–) ELEMENTS	TOTAL (– –) PROJECT

Figure 7. Standard Cost Break-down for Building Projects
(according to *SfB basic table 1*, CIB report No. 22).

Figure 7 illustrates the recommended standard cost break-down for building projects. This method of cost control is widely used. The Irish National Standard may be taken as an example[9]. The method may be extended to include the equipment. The SfB-system is used also for arranging project information and related general information.

The cash flow chart should be based on the timing schedule of the procedure (compare Figure 9) and then worked out later into details to be included in the client's general cash flow chart for payment of debts.

It may be noted that clients' failures to pay their debts promptly may be a main cause of high prices for construction in development countries. Long-term planned demand, safeguarding a regular flow of production both in factories and on sites, together with a related stable and continuous cash flow, is one of the

9 National Standard Building Elements and Design Cost Control Produces. An Foras Forbatha, St. Martin's House, Waterloo Road, Dublin-4, Ireland.

major promoters of building rationalization and consequently decreasing costs. It will be advantageous for any permanent building client, therefore, to plan his production for such continuity.

3. Plan of Action Practice and procedures are crucial factors in the building process.

A direct copying of current procedures in the industrialized countries into similar procedures in developing countries is not suitable. It has been tried, but has resulted in small number of *copied* projects and an enormous shortage of vital housing and related community facilities including schools. The *copied* projects mostly rely haevily on imports, which means that the domestic building materials industry does not develop because there is not enough demand for its output.

The complexity of the construction industry presents difficulties which have to be overcome. Many clients represent all kinds of building requirements – residential buildings, non-residential buildings (among which are the schools), and other construction works. The building of all these required units has to be co-ordinated.

Planning offices prepare national, regional and local plans for co-ordinated location of the units, but there may be little or no organized co-ordination of the different parts of the machinery producing the units.

The traditional procedures in industrialized countries are mostly based on a three level market:

– *First* The client consults the architect and related specialist engineers to decide exactly what his building is going to be like and what materials are to be used – the design level.

– *Second* In some countries by the intermediary of a specialist (English Q.S. = Quantity Surveyor) a contract (or a set of contracts) is signed with the contractor(s) who construct(s) the building – the construction level.

– *Third* There is a well-stabilized market for the supply of the resources needed for the construction: financing, skilled labour, adequate plant, factories making resources, and an adequate trade and transport system for their delivery – the supply level.

The building materials market originally grew as a separate national (even regional or local) market in each country. No country, so far, has been able to develop a sufficient construction industry without the support of a national building materials industry, based on indigenous raw material supply.

School building is an important part of the purely domestic activities. When planning and building the individual school, the client must use a procedure which safeguards the supply of the resources needed. Imports – if used at all – should be carefully selected for improvement of domestic resource production, not for direct consumption in individual buildings.

This is one of the reasons why practice and procedure in school building in industrialized countries cannot be directly copied for school building in developing countries. The architect (design generally) cannot rely on a stabilized market of resource supply. He must first find the method of supply and then design the school accordingly.

Figure 8 illustrates the totality which should be recognized in the client's plan of action. The client should analyse his needs and desires in the light of his own financial capacities and the supply possibilities of the existing market. His programme of requirements and his economic plan are translated into the design by which the flow of materials from the natural resources to the result – the building in reality – is initiated and controlled. Basically, this pattern applies to all stages of development. None of its constituents should be neglected.

The design function in a developing country is much more comprehensive than in industrialized countries. Design regulates the flow of materials from natural resources to the end result of construction, the built environment. The

main bottle-neck hampering the development of an efficient construction industry is to be looked for in the domestic materials industry. Design must aim at developing that industry for sufficient building capacity to meet all needs — residential buildings, non-residential buildings (among which are the schools), and other construction works.

Financial restrictions are related to the export-import business, not to the use of indigenous raw materials by indigenous production methods in a self-reliant society (as long as there is no labour shortage).

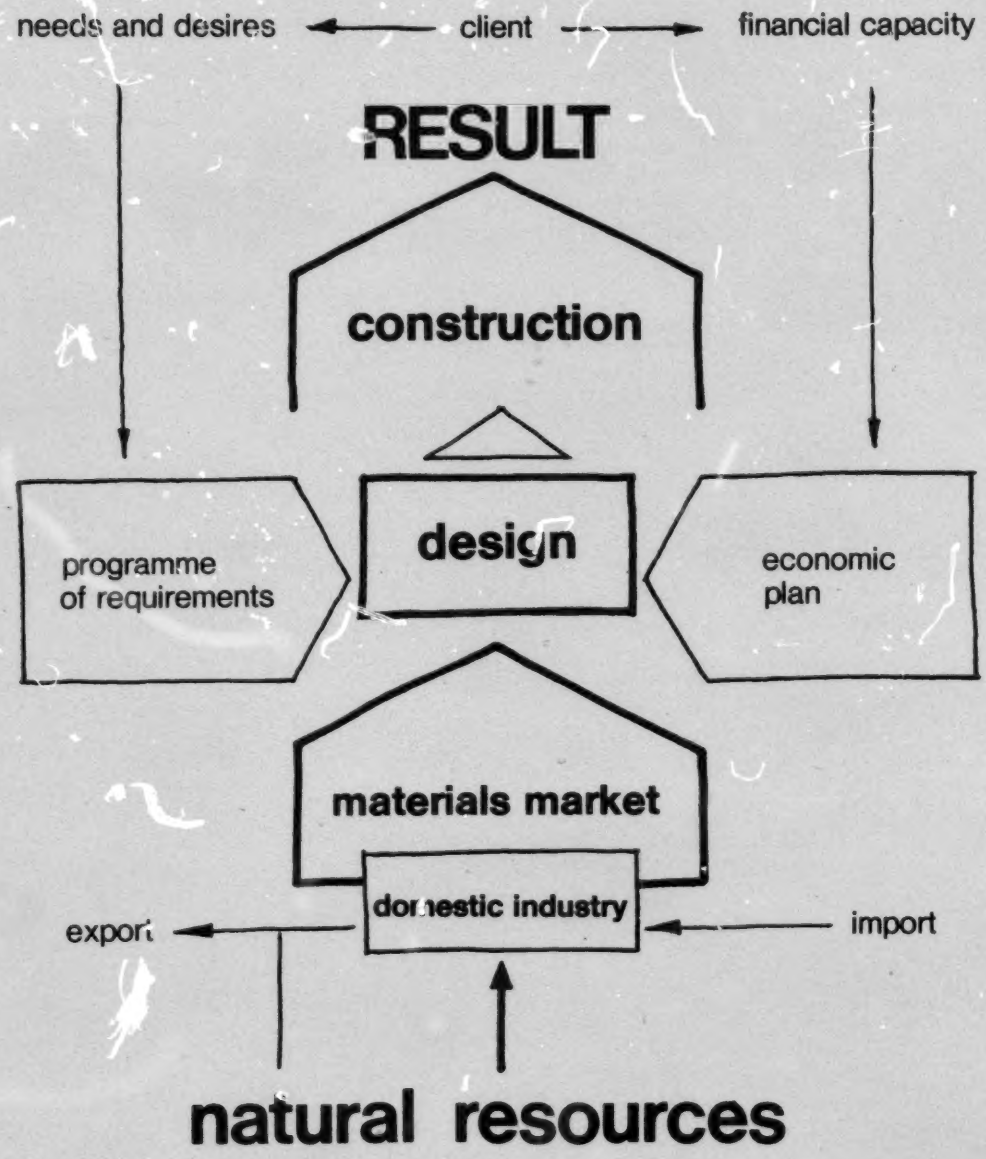


Figure 8. Building and its implications.

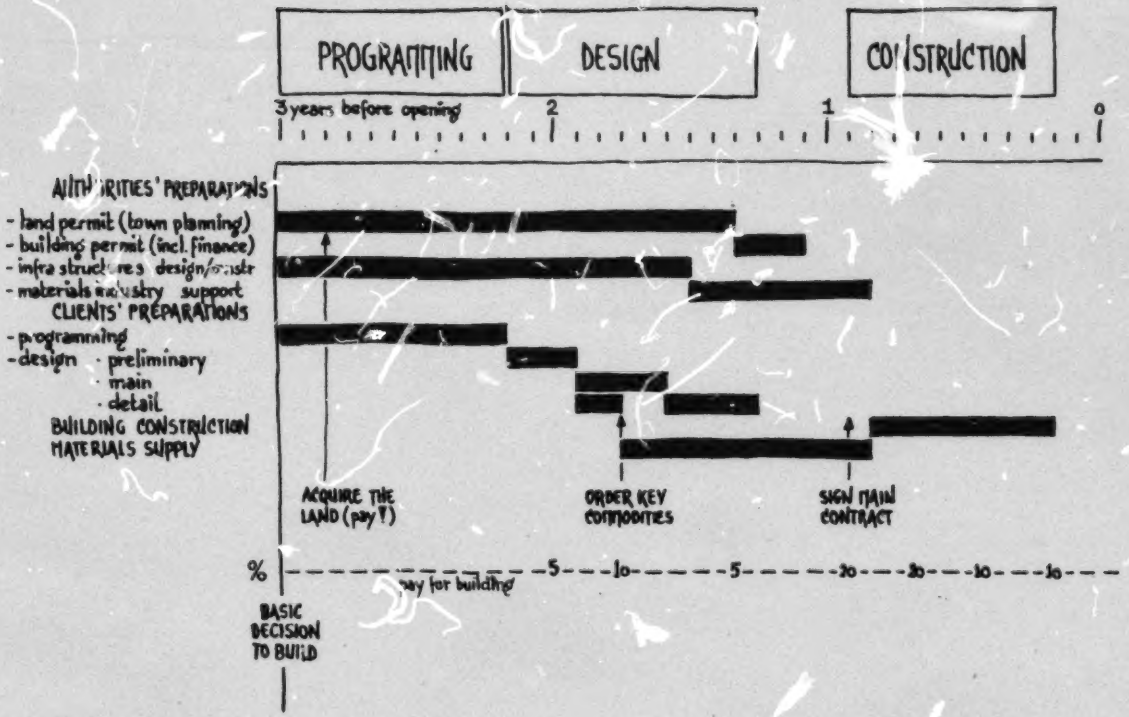


Figure 9. Client's timing memorandum model.

From a procedural point of view, the need to strengthen the building materials industry may imply that the supply of materials and components according to drawings and specifications should be separated from construction contracts. Materials and components (some of them, at least) may have to be ordered directly from factories and workshops some years before they will be needed in the construction process. The preparation period, thus, may be considerably longer than usually needed in the *industrialized* procedure model.

Another reason for expecting a long preparation time (before starting construction) is presented by the land preparation procedures. These are of two kinds:

- Land acquisition (including town planning procedures), and
- infrastructural supply (roads, water, electricity, etc.).

The client should not rely on other authorities that these necessities will come automatically. Experience shows that they are heavily time-consuming and may cause considerable – but mostly unexpected – delay if not properly dealt with by the client and his advisers well in advance.

As a general rule, it may be advisable to expect even a medium-size secondary school to be opened not earlier than three years after its building was decided upon (Figure 9).

5. School building in the modern sector

So far consideration has been given to the planning of the schools from two aspects, the macro-aspect and the micro-aspect. Similarly, there is a two-pronged approach to the production of schools: the production of the things needed – which may be bought on the market – and the actual construction that is, the use of these things on the building site (Figure 8). The construction part of the production will now receive first attention here, after which the supply of materials, tools and plant will be dealt with, realizing that the planning and production of schools presents a problem of integration.

Construction There is no big difference between school construction and the construction of other buildings. A complex set of specialist teams – the gangs of workers – with their specialist tools are organized as efficiently as possible to assemble hundreds of different items – the building commodities – into a building. Building construction is basically a logistics problem. Transport timing and transport plant are essential factors for construction.

Five constituents are usually considered for the choice of construction method:
- Finance, *the flow of money,*
- Management, *mainly logistics skill,*
- Plant, *mainly transport equipment,*
- Labour, *skills, and*
- Commodities, *see further chapter 5, The supply problems.*

The basic difference between labour-intensive production methods and capital-intensive production methods is well-known.
As long as there are vast under-employment problems in a country, the labour-intensive methods have to prevail.

Modern development, however, implies replacement of muscle-work, based on food for fuel, by motor-work based on waterpower or oil, nuclear energy, etc. for fuel. Food for fuel may cost 50 cents per kilowatt hour of work, whereas the price of electricity may be 10 cents and the price of oil 5 cents for the same work. On the other hand, the capital to be invested in motorized plant may be a few hundred dollars per kilowatt, implying another 5 or 10 cents per kilowatt hour of work, roughly speaking. Thus mechanization (motorization) is considered economically defendable even in early development. It should be noted, however, that this kind of reasoning does not apply in a country where thousands of men are unemployed (and have to eat anyhow) whereas the machines and mostly also the fuel have to be imported and paid by export earnings.

The mechanization of the construction industry may run parallel to the development of prefabrication methods, but the actual use of prefabrication methods is based on an entirely different reasoning.

Pre-development constructors work with raw materials to be shaped and assembled on site. Modern building transfers the shaping of the units to workshops and factories (off site) and reduces work on site to the assembling of the

prefabricated units. Prefabrication methods may be labour-intensive too. Mechanisation and prefabrication are interdependent only as far as the sizes of the prefabricated units are concerned. Big units must be mechanically handled; smaller units may be handled manually. The key to prefabrication is precise measuring and careful handling.

It is well-known that both these conditions require special training and special methods and tools for precise measurement. Such training, however, is entirely different from the traditional training into *skills*. It is more a change of the workman's mentality than a specialization in the use of his tools (which traditionally meant shaping of units in direct relation to their assembly on site).

The demand for prefabrication is intimately related to the requirement of flexibility in building. Flexibility implies the requirement that partition walls and fixed furniture must be assembled in such a way that they can be easily moved.

The taking down and re-assembling elsewhere of building elements necessitate exact measures according to a system of dimensional co-ordination. Dimensional tolerances must be carefully studied and adhered to.

Workshop production methods can easily satisfy the requirements, but traditional site-working methods are not suitable for such precision.

The most difficult problem seems to arise on the level of construction management. Constructors and foremen trained in traditional building methods find it difficult to re-adjust their thinking and acting to the requirements of prefabrication methods. There is also the difficulty of integrated co-operation. Prefabrication involves design, workshops, transport and site assembly. It is obvious, furthermore, that school building alone cannot change the outdated building tradition. The integration asked for is not only vertical (the production line), but also horizontal (over a wide field of different building projects, Figure 11).

It may be advantageous to use a standard method of arranging information related to building materials supply, construction activities and resulting building elements in order to facilitate communication and co-operation between all parties involved. The need for such a method – a classification system for building production generally – has long been felt. Based on Scandinavian experience, the SfB-system was created 25 years ago and recently put under international control. It is now widely used and recommended for building project information and related general information[10].

The integrated approach is indispensable. Design teams have to co-operate with producers of building components, and these producers must base their production on indigenous raw materials in order to prevent the bottle-neck of imports. The design must be much more of an industrial design, with a clear vision of what is needed – not only now but also in the future – and a clear knowledge of the domestic resources and the production and construction possibilities. Such an integration cannot come about spontaneously by market forces. It has to be planned and guided centrally. The Government (and its relevant agencies), in co-operation with the architects and engineers association and the relevant industries, should organize the integrated research, planning and production promotion needed.

The end result to be aimed at should be a continuous national manufacturing and construction flow which produces enough houses, enough schools and enough of other buildings and construction works for the developing national population from indigenous natural resources.

This result may not be so difficult to achieve as it may sound. The number of types of components needed is limited. The basic materials and components which *must* be supplied are, in fact, relatively few. They may be designed and produced for different levels of construction sophistication: primitive self-help

10 See footnotes Chapter 4. *The cost break down (section Macro-planning).*

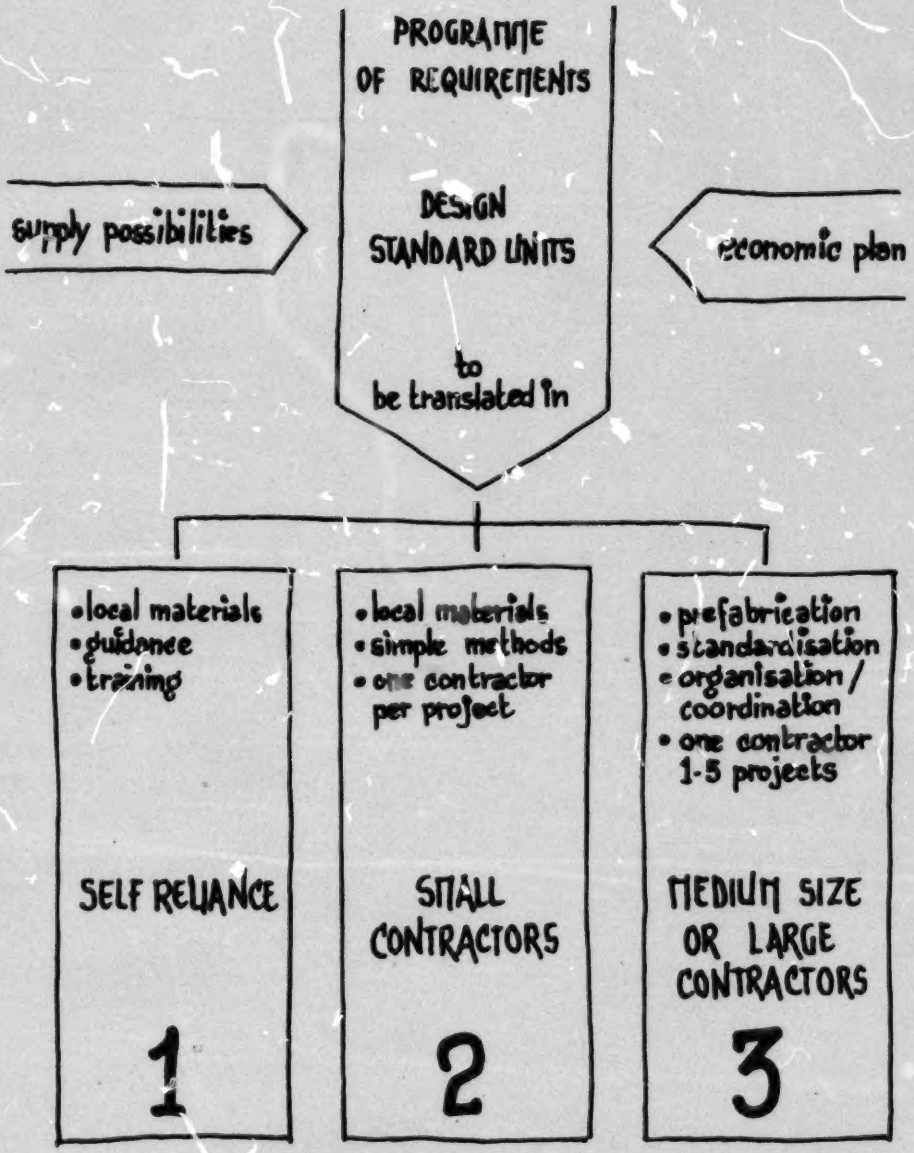
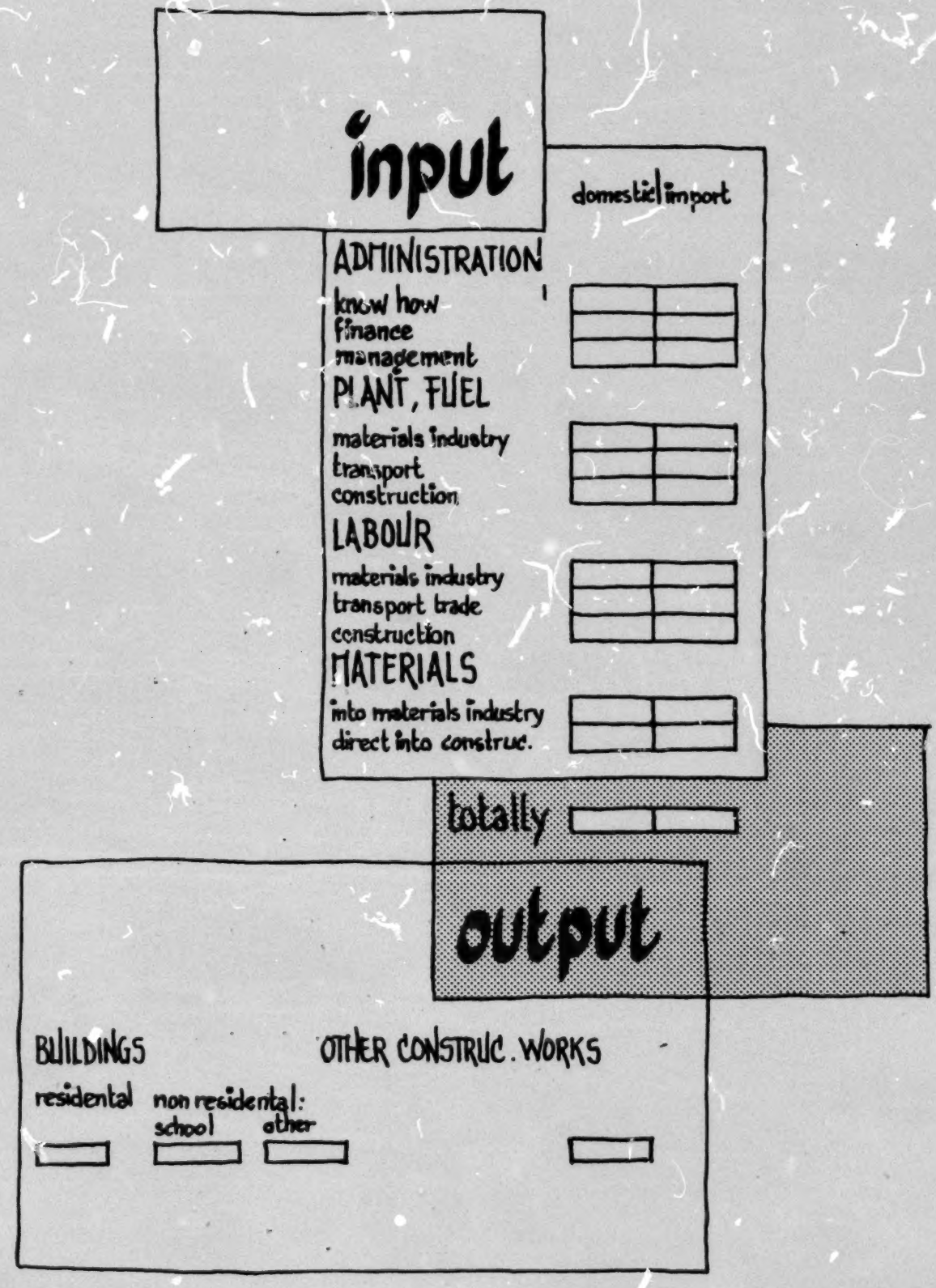


Figure 10. The Production of Schools as Part of a Development Plan for Construction.

methods, small building enterprises or larger construction firms. The crucial point is that the demand has to be created. No demand will be visible until the components are in the market, and no components will be produced if there is no demand! The demand can only be created by the joint efforts of clients, financiers and designers. Moreover, the Government of the nation must be interested in promoting such demand-development, especially the school builders and the housing promoters.

In the first instance, it is not a question of changing the methods of building, only to safeguard a rational supply for increasing the capacity of the construction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LABOUR
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industry. The change-over from traditional inexact building methods to more precise methods of workshop prefabrication and site assembly implies a long-term socio-economic development. It is not necessarily linked to heavy capital investment; it may well be managed within the framework of a labour-intensive industrialization policy, but it needs conscious development planning.

In the meantime, however, before the prefabrication system can be implemented – and that may take decades –, traditional building methods have to be accepted. In this interim period it is essential not to make such investments in school building which later have to be regretted. Construction methods may be gradually improved; the ICS is prepared to advise on such improvements based on prevailing local conditions.

The Supply Problems In early development both the supply of plant and tools and the supply of building materials have a tendency to form bottle necks in the building production process.

This may often be caused by import restrictions, but even countries with money enough from exports may not be able to develop their building materials supply as fast as wanted. School building in this context is part of the entire building sector of the nation's economy and cannot be treated separately.

As pointed out earlier it should not be expected that national building materials industries will grow spontaneously to supply the materials required for the implementation of a development plan for construction, part of the nation's socio-economic development plan.

Building materials industries must be planned and built in close contact with settlements planning. Obviously neither schools nor any other buildings can be built without proper materials supply, and most of the basic building materials are too heavy to allow for long transports.

Furthermore, in most developing countries imports for investment in basic industries (such as building materials industries) should be given priority as compared to imports for consumption (including components for construction). In a spontaneously working desing and construction system it is not to be expected that architects would specify non-existent national components if they can choose from catalogues showing perfect elements for import.

The hope that *my project* will be lucky enough to find the materials specified – even if they have to be imported – is tempting enough. There is, however, an unfair gamble involved in this reasoning which can only be overcome by conscious governmental promotion of the proper development of local (or national) building materials industries. This promotion must go hand-in-hand with design efforts to include nationally-produced commodities in building specifications. There must be a direct linkage of building design to the production of building materials and components. If this linkage is rightly managed, there may be a short-cut to the development of the systematic prefabrication method asked for. The ICS is prepared to advise on the methodology envisaged. The school building programme of the nation may present the best model for such an integrated approach to building development,

. It should be mentioned that the investment in plant off site as well as on site for building construction is part of an integrated building programme. The production line from natural resources to finished buildings should be considered as a chain (or network) of activities where investment in any one link depends in investment in the others for a maximum efficiency of the whole production sequence, including transport and trade efficiency.

The right balance between imports for the different stages of production in the whole process may have to be studied and the final output has to be considered both quantitatively and qualitatively not only in relation to requirements, but also in relation to the resources (Figure 11).

6. Institutional arrangements[11]

The educational systems of a country has been characterized as the fundament of development. School buildings represent the focal points of education and therefore – in one way – also the focal points of develoopment. More and more, schools are considerd to be cultural centres. They are no longer planned as isolated educational institutes for children and youngsters of different ages. They may gradually develop into cultural development centres and meeting-points for all ages and even be related to centres for shopping and relaxing; in other words, parts of the centres for social being combined with individual human development.

On the other hand, of course, each school must have its own clear goal of education and training. It must be known who is going to be trained, also why and how (Part 1, Page 6).

In former times there were Ministries of Education and related local school authorities ruling the schools, both their building and their running. They did not ask anybody for co-operation. They felt it their duty to rule the curricula for the children, to see that they learned what they were supposed to know. They put them in classes of 30 under the command of one teacher for each class. Knowledge was divided into precise subjects and days were divided into precise hours – each hour one subject, one teacher –, always in the same class, in the same place, with the same class-mates. A manageable routine for the administration, but not an ideal one, by any means.

But this is no longer the case. The trends of deliberation in education and the trends of integration of schools into the social activities generally of the members of the society is breaking down the walls between the authorities of the administration, both locally and centrally.

Parents come into the schools and discuss problems with the teachers. Children of different ages may work together or alone or come together in hundreds for a film show or a lecture. Vocational training is mixed with preparatory studies for higher professions. The comprehensive secondary schools is largely replacing the *high schools* and *polytechnics* and *commercial schools.*

These trends will undoubtedly gradually influence the total organization of governmental organization, both locally and centrally. Cultural centres with integrated schools cannot be planned or built or run by school authorities alone. Financing alone raises new problems.

In the countries where those trends have reached furthest, public participation in the management of the centres seem to be dominant, although the centres may formally be organized as foundations supported by tax money. Civil servants may act more as advising members to the Board than rulers of the development.

In early development this kind of integration of schools in cultural centres may not be feasible in cities where the general education has not yet reached the level needed and where traditional solidarity cannot be relied upon. But in

11 Reference is made to the relevant OECD Report; see footnote no. 1. Here only some specific aspects of the need for integration and public participation are added.

settlements with a tradition of municipal solidarity and public participation the decentralization trend now regaining its validity in highly-developed societies may be the solution. This may mean development at a speed set by the desires of the peoples.
The development will be their own, not the invention of some one else imposed upon them.

Development, then, must not be accelerated in the direction which was centrally planned by foreign advisers, but it must grow organically from the ethnic roots of the people.
In this context the intermediary school described in Part 1 may be the base for a better future school system rather than a provisional arrangement.
The *modern education* may not be the best one after all, not even in the fully-developed society.

The problems of building in early development have been analyzed in the previous Chapters. It was pointed out that school building depends on the supply possibilities of building materials and that the manufacturing of suitable components from indigenous raw materials presents a key problem. This problem cannot be solved by school builders alone. It demands integrated efforts and far-reaching institutional co-operation, both in Government and private practice. Research and planning co-ordinating institutes may have to be created or developed within the present institutional framework.

Again there is no standard solution to the problem, but the ICS is prepared to share its knowledge and experience. The solutions to the institutional problems can only be found on the basis of locally (or nationally) prevailing conditions. In this case, the conditions do not depend so much on economic factors or sociological phenomena but more on the human beings themselves.

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